Huntleigh
HEALTHCARE

Flowpress®

Sequential Compression System

Service Manual

Preface

Review this manual before attempting to service or repair the equipment.

This manual is intended to be used only by qualified Huntleigh Healthcare service technicians. In the event that the manual is provided to a customer in response to customer requirements, the customer is advised not to attempt repairs and to direct any required service to qualified Huntleigh Healthcare service technicians. In no event will Huntleigh Healthcare be responsible for any service performed by customers or third parties.

Warnings, Cautions and Notes

WARNINGS given in this manual identify possible hazards in procedures or conditions which, if not followed correctly, could result in loss of life or severe personal injury.

CAUTIONS given in this manual identify procedures or conditions which, if not followed correctly, could result in equipment damage.

NOTES given in this manual are used to explain or amplify a procedure or condition.

General Warnings

WARNING

Before performing any service or maintenance procedures, ensure that the equipment has been adequately decontaminated.

Voltages in excess of 30 volts RMS or 50 volts DC can, in certain circumstances, be lethal. When working on equipment requiring exposure to live unprotected conductors, where such voltages are present, extreme care must be exercised.

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1 INTRODUCTION

1.1 How To Use This Manual

This manual contains information for servicing the **FLOWPRESS®** system which consists of a pump and one, three-chambered garment.

The manual is partitioned with tabbed dividers for ease of use and consists of the following sections:

Section 1 - **Introduction:** includes a general description of the system operation and a servicing protocol.

Section 2 - **Operational Maintenance:** describes both functional and static checks to ensure correct operation during the service life of the system.

Section 3 - **Troubleshooting:** contains details of fault symptoms, their possible causes and suggested steps to correct the problem.

Section 4 - **Preventive Maintenance:** contains a list of parts which must be replaced periodically to ensure the correct operation of the system.

Section 5 - **Servicing the Pump:** contains illustrated instructions for replacing pump components, together with testing and calibration procedures.

Section 6 - **Technical Specifications:** contains a list of technical data.

Section 7 - **Spare Parts:** contains a recommended list of spare parts which should be kept in stock.

Appendix A - **Diagrams:** contains electrical wiring and pneumatic diagrams.

Appendix B - **Parts List:** a list of currently available spare parts.

1.2 Technical Description

FLOWPRESS is a sequential compression system used in the treatment and management of venous or lymphatic disorders.

The system comprises:

1. Pressure regulator pump Model AC300
2. One garment from the FLOWPRESS range

Pressure regulator pump unit AC300 to be used with FLOWPRESS garments only.

The pump supplies cycles of air pressure, which segmentally inflate the three-chambered garment, and provides gradient pressures up the limb. The pump operates on a 3 minute, automatically timed cycle which inflates the garment distally to proximally.

Total time inflated	Chamber 1 (lower) 1 minute 54 seconds Chamber 2 (middle) 1 minute 16 seconds Chamber 3 (upper) 38 seconds
Deflation	1 minute

The pump unit is a piece of precision equipment and, provided it is handled and serviced correctly (normally every 12 months), should give long and trouble-free service.

Controls and indicators on the pump unit comprise:

(a) Power switch (green rocker switch) illuminated when in the "ON" position

(b) Pressure control knob, offering pressure adjustment between 30 mmHg and 100 mmHg

(c) Pressure gauge

FLOWPRESS garments have three chambers which overlap to prevent ridging along the length of the limb.

1.3 Servicing Protocol

1.3.1 General Service - Pump

Initial Assessment (Visual check):

(a) Enclosure for integrity and cleanliness of top and base

(b) Fittings for damage and security

(c) Labels are secure and legible

Open Pump:

(d) Wiring and terminations are secure

(e) Tubing security and integrity

(f) Components fastenings are secure

(g) General condition inside is clean

Open Compressor:

(h) Silencer bag weld seams

(i) Bellows/armature blade assembly condition

General:

(j) Check power lead assembly for security

(k) Clean condition of pump

If any items in a) - i) appear defective, replace with appropriate spare part and record action on service record sheet.

Re-assemble pump unit completely.

1.3.2 Garment Service Protocol Following Cleaning

Lay out garment and check:

(a) General condition of garment

(b) All components are secure and intact

(c) Tubes and connectors are in good condition

Inflate System:

(d) Garment integrity* (i.e., no leaks)

*The system should be run for a minimum of three cycles (9 minutes) to ensure full inflation.

1.3.3 Testing

The following procedures should be performed following any repair and as part of the routine service.

Perform electrical safety checks, pressure, flow and calibration checks and functional checks as given in Section 5.

It is important to ensure that all tools which are used for servicing are kept in good condition and test rigs for flow and pressure are regularly calibrated to a reference gauge with calibration directly traceable to appropriate National Standards.

2 OPERATIONAL MAINTENANCE

2.1 Routine Checks

These procedures should be performed each time the system is used.

2.1.1 Pump Unit

(a) Inspect the pump unit for external damage to case, controls and connections

(b) Inspect the electric cord for damage, cuts, abrasion, twisting and replace if necessary

(c) Test all controls

2.1.2 Garments

Check integrity of garments. Visually inspect for punctures, tears, damage to connections, fasteners and tubes.

3 TROUBLESHOOTING

This section lists problems which may occur after long periods of time, and outlines the corrective action.

The following checks should be performed by a Huntleigh Healthcare technician.

3.1 Preliminary Checks

Check the following before dismantling the pump unit:

1. Verify that all tubing connections on pump and garment are securely fastened and in place.

2. Visually inspect tubing and garments for punctures or tears.

This eliminates possible garment and tubing faults.

3.2 Further Checks

3.2.1 Low pressure fault

Check position of pressure control knob.

Adjust pressure control knob if necessary. Refer to pressure check and calibration in Section 5.

3.2.2 Continuous (high) pressure fault

If the pressure gauge indicates a pressure higher than the control setting:

Switch off pump and remove garments.

A continuous pressure fault condition occurs when the timer motor stops rotating (air pressure will not be sequential at the three pump outlets). If this should occur, the timer motor may be defective.

WARNING

Danger of electric shock. During the following tests live terminals and conductors will be exposed.

Check the integrity of the electrical connections of the timer motor.
If connections are sound and the motor still does not rotate, the timer motor must be replaced.The timer motor is a sealed unit which cannot be repaired.

When replacing the timer motor it is advisable to replace the rotor/stator assembly at the same time.

Switch off pump unit and disconnect the supply cord from the power outlet before starting any repair work.

3.2.3 Loss of air output pressure

If the garments do not inflate, check them for leaks or kinked tubing.

If the garments appear satisfactory, the pump unit internal compressor must be tested.

> **WARNING**
>
> **Danger of electric shock. During the following tests live terminals and conductors will be exposed.**

1. Switch off pump unit and disconnect the supply cord from the power outlet.
2. Remove unit lid as described in Section 5.
3. Disconnect the compressor outlet tubes from the 4 way connector and connect a "Y" piece to the two tubes.
4. Connect a pressure gauge to "Y" piece outlet.
5. Reconnect the power supply cord and switch on the pump.

The pressure reading should be at least 130 mmHg.

If the pressure does not reach 130 mmHg or drops quickly, this may be due to:

(a) Leak in air silencer bag

(b) Tube disconnected between compressor and silencer

(c) Defective compressor

Disconnect the power supply again and remove the compressor lid. Remove the silencer bag from the valve bodies and connect the pressure gauge to each valve body in turn. The pressure reading should once again be approximately 130 mmHg.

If this pressure cannot be reached, the bellow/armature assemblies and valve bodies must be replaced. If pressure can be obtained, the silencer bag assembly must be replaced.

Switch off pump unit and disconnect the supply cord from the power outlet before starting any repair work.

If the compressor is operating correctly but the correct pressure cannot be obtained at the pump outlets, the rotor/stator assembly and the pressure control assembly must be checked.

1. Remove the timer motor/gearbox assembly as described in Section 5.
2. Compress the rotary valve assembly and remove the drive pin.
3. Check the bearing surfaces for cracks or bad scores. Also check the security of the elbow connector.
4. Remove the pressure control assembly as described in Section 5.
5. Remove four M3 cheese head screws to access the diaphragm. Inspect the diaphragm for signs of splitting.

Any damaged parts must be replaced. It is recommended that the complete assembly is replaced.

Switch off pump unit and disconnect the supply cord from the power outlet before starting any repair work.

3.2.4 Loss of electrical power

Power loss can be due to the following:

1. No electricity supply at wall outlet
2. Faulty wall outlet
3. Damaged plug or electric cord
4. Defective fuse link
5. Damaged internal wiring

Check and repair as indicated.

3.2.5 Technical assistance

Technical assistance, if required, is obtainable from:

Service Department

Huntleigh Healthcare Inc.

227 Route 33 East

Manalapan, New Jersey 07726

Telephone : 1-800-223-1218 Ext. 4
Fax : 908-446-1938.

4 PREVENTIVE MAINTENANCE

The following preventive maintenance should be carried out every 12 months.

4.1 Pump Unit

Replace the following components:

1. Silencer bag
2. Pivot points
3. Bellow arms
4. Valve bodies
5. Compressor air inlet sponge filter
6. Compressor gasket

Check:

(a) Base is free from debris
(b) Filter sponge position is correct
(c) Compressor seating
(d) Electrical connections are secure and completely insulated
(e) Pressure control knob is tight
(f) Tubes are fully pushed on and are free from kinks
(g) Tubes and electrical insulation are not damaged
(h) On/Off switch illuminates
(i) Wiring is tidy
(j) Air is cycling between three pump outlets

4.1.1 Testing

Test the unit as instructed in Section 5.

Caution

All servicing and repair work must be performed by a Huntleigh Healthcare service technician.

5.1 Dismantling the Pump Unit

Before dismantling the pump unit, ensure that it has been switched off and isolated from the power supply by removing the electric cord plug from the wall outlet.

To remove the case lid, place the unit upside down on a flat, clean surface. Remove the rubber feet and unscrew the four fixing screws.

Holding the unit in both hands, turn it onto its base.

☞ *The pressure gauge is mounted on the lid and is connected by a flexible tube to the main assembly.*

Carefully remove the lid (push the three-way pump outlet out of the slot in the lid as you do so) and place to one side of the base.

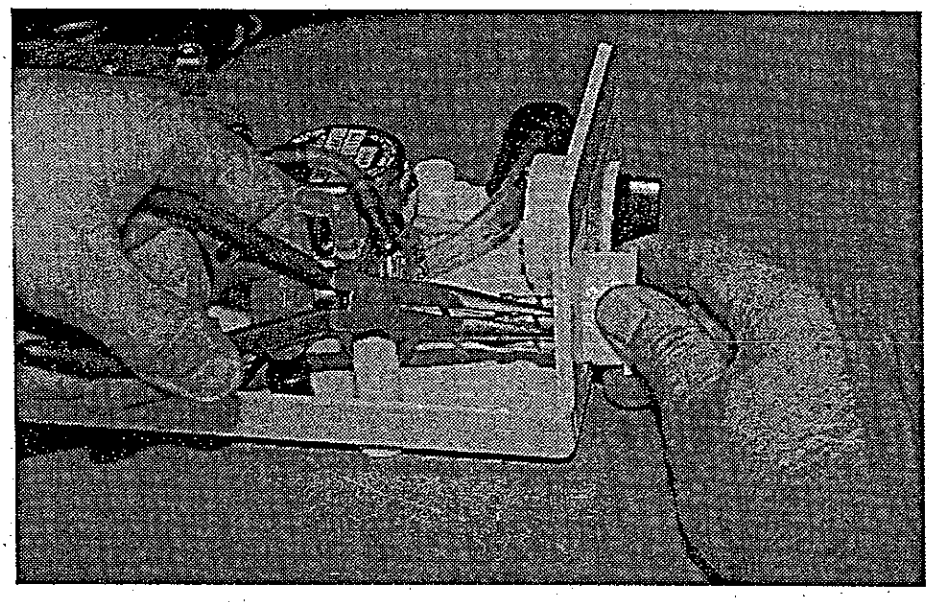
5.2 Replacing the Pressure Gauge

Disconnect the tube from the pressure gauge inlet. Remove the three self tapping screws and the fixing clamps which attach the gauge to the case lid. Remove the pressure gauge.

Replacement is a reversal of the above procedure.

5.3 Replacing the On/Off Switch

To remove the on/off switch, disconnect (pull off) the electrical connections, squeeze together the retaining flanges located at the top and bottom of the switch body and push the switch through the front panel.



To replace the switch, push in from the front ensuring the switch retaining flanges snap into position.

Reconnect the electrical connections as per the wiring diagram.

5.4 Replacing the Fuse Holder

Disconnect the fuse holder wires from the on/off switch and from the terminal block. Compress the retaining flanges on the fuse holder body and push the fuse holder out of the case.

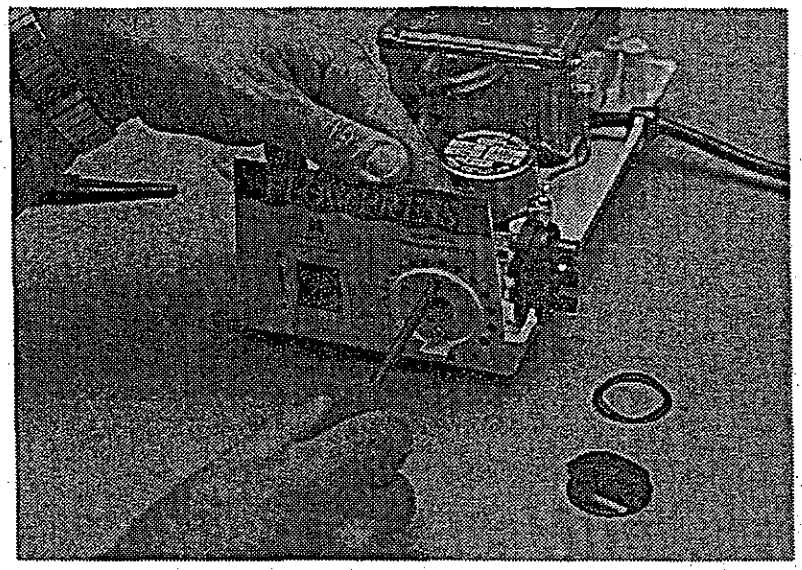
Replacement is a reversal of the above procedure.

5.5 Replacing the Pressure Control Assembly

Find the tube which is attached to the assembly and disconnect it from the three-way 'T' connector.

Remove the control knob. Unscrew and remove the two countersunk head screws which secure the assembly to the case.

Remove the pressure control assembly from the case. Remove the tubing from the assembly.



Connect the tube to the new pressure control assembly and install the assembly in the case, ensuring that the tube connector is at bottom left. Pass the tube beneath the on/off switch wires.

Secure the assembly to the case with two countersunk head screws.

Reconnect the tube to the three-way 'T' connector ensuring there are no kinks, and tube is pushed fully onto the mounts.

Check air flow and calibrate as instructed in Section 5.

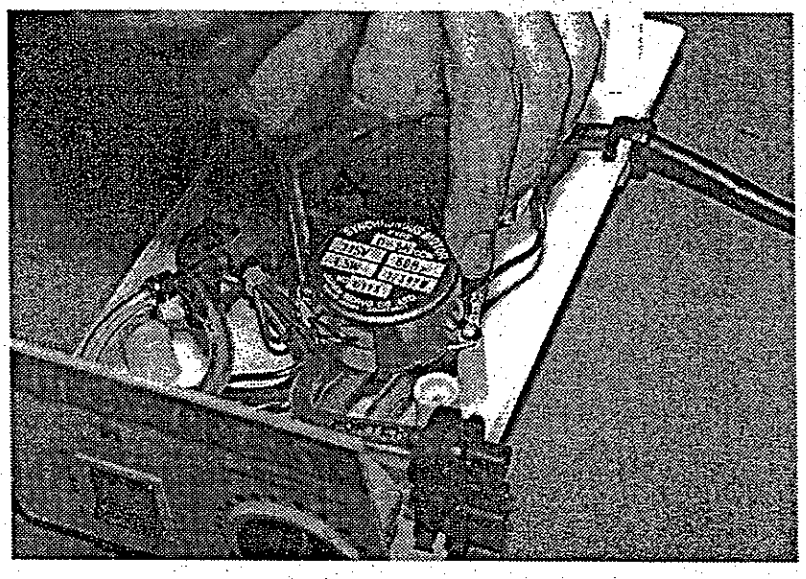
5.6 Replacing the Timer Motor/Gear Box Assembly

The timer motor is a non-repairable sealed unit and must be replaced if faulty. It is advisable to replace the complete assembly if faulty.

Remove the two screws and lock washers which attach the motor/gearbox assembly to the support pillars in the case. These screws also secure the ground wires.

Make a note of the position of tubes and connections. Find the tube which is attached to the elbow on the assembly and disconnect it from the four way connector at the compressor outlet. Disconnect the electrical wires from the terminal block.

Remove the assembly from the case, together with the tubes and the three-way pump outlet. Disconnect the tubes from the assembly.



Replacement is a reversal of the above procedure.

When reconnecting tubes to the assembly, ensure that they are in the correct sequence, with the left tube going to the top of the three-way pump outlet which is the larger (female) port. Ensure there are no kinks, and tubes are pushed fully onto their mounts.

When securing the assembly, refit the ground wire tags between the fixing lugs and the lock washers.

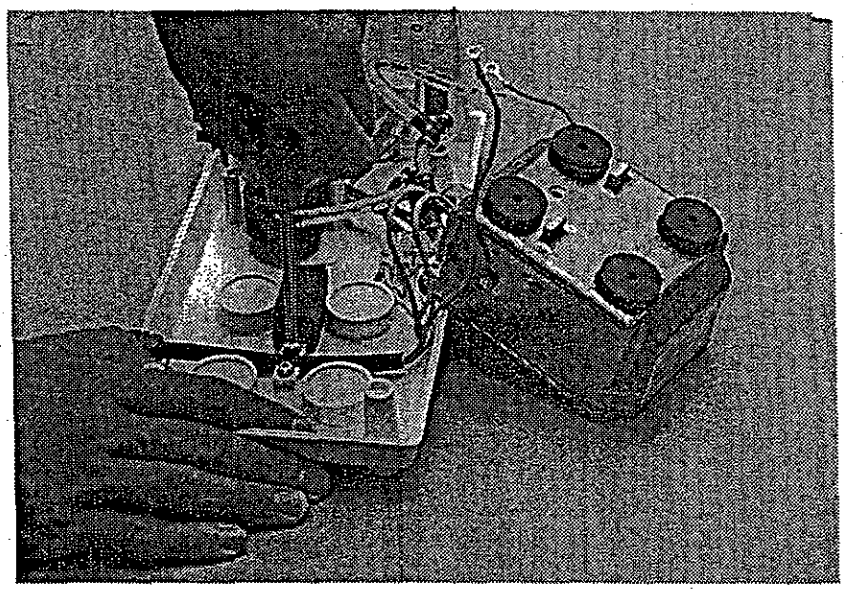
5.7 Replacing the Electric Supply Cord

The supply cord is fitted with a molded non-rewireable plug. This assembly is not repairable and, if faulty, must be replaced. Do not attempt to replace the plug with a rewireable type as this will negate any warranty.

When an unserviceable power supply cord fitted with a non-rewireable plug is removed from the equipment, the cord and plug must be destroyed and disposed of safely. To avoid the danger of electric shock the plug must never be inserted in any power outlet.

Remove the two screws and lock washers attaching the timer motor/gearbox assembly, thus releasing the ground wires. Carefully lift and lay aside the compressor assembly.

Remove the two self-tapping screws attaching the cord clamp plate to the bottom of the case. Disconnect two wires from the terminal block. Remove and dispose of the unserviceable supply cord.



Thread the new cord through the strain relief bush in the case and connect the two power wires to the terminal block as shown in the wiring diagram. Fit the clamp plate with two self-tapping screws, ensuring that the wires are not strained.

Reposition the compressor assembly.

Replace the two screws and lock washers attaching the timer motor/gearbox assembly, installing the tags on the ground wires (from the compressor case and the new cord) between the fixing lug and the lock washer.

5.8 Replacing the Compressor Air Inlet Sponge Filter

The filter is located underneath the compressor and is attached with adhesive to the base of the pump case. Disconnect the ground wire from the side of the compressor case. Carefully lift and lay aside the compressor assembly.

Pull off and discard the old filter.

Clean the relevant area of the base to remove all traces of old adhesive, using an alcohol based cleaning agent in accordance with the manufacturer's instructions.

Peel the protective film from the underside of the new filter and press the filter firmly onto the base, ensuring that it is correctly positioned to align with the air inlet hole in the compressor case.

Reposition the compressor assembly. Reconnect the ground wire to the side of the compressor case.

5.9 Replacing the Compressor Assembly

Disconnect the compressor outlet tubes from the four way connector. Disconnect the compressor wires from the terminal block. Disconnect the ground wire from the side of the compressor case.

Remove the compressor assembly from the pump case.

To replace the compressor: ensure that the four compressor support rubbers are in good condition (replace if necessary) and install the compressor assembly, positioning the support rubbers carefully in the recesses in the bottom of the case.

Make sure the inlet filter sponge is correctly positioned.

Connect the outlet tubes to the four way connector, ensuring there are no kinks. Connect the compressor wires as per the wiring diagram. Reconnect the ground wire to the side of the compressor case.

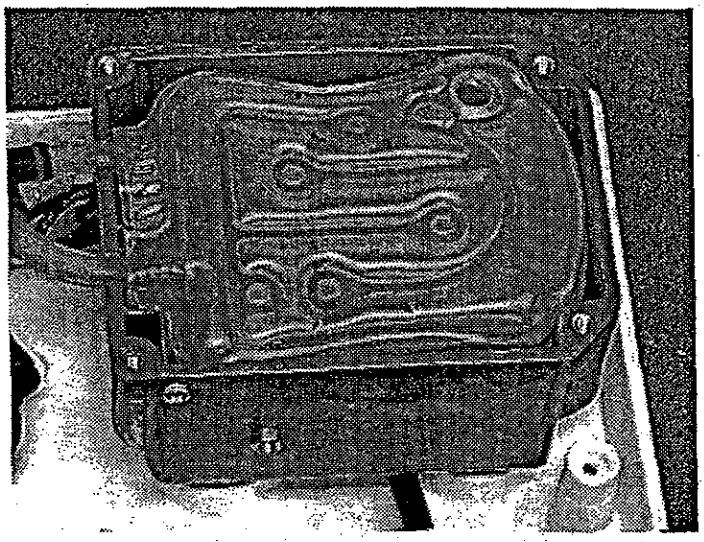
5.10 Replacing the Compressor Assembly Components

Unscrew and remove the 4 x M4 countersunk screws, remove the lid and gasket and place the lid to one side. Discard the old gasket and replace with a new one.

5.10.1 Silencer Bag Assembly

Disconnect the silencer bag outlet tubes from the four way connector. Disconnect silencer bag inlet tubes from the valve body assemblies.

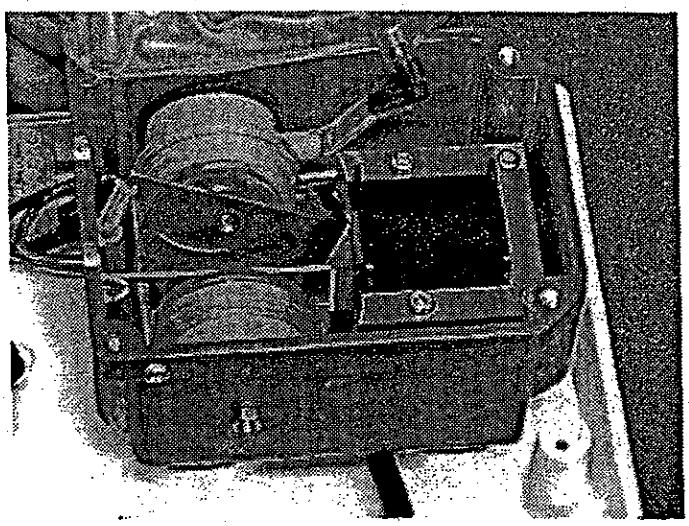
Replacement is a reversal of the above procedure.



5.10.2 Bellows/Armature Blade Assemblies/Pivot Points

Using long nosed pliers, extract armature blade from pivot point and unclip bellow from valve body assembly.

If necessary, use a sharp pointed tool to remove the pivot points from the holes in the compressor case.



Replacement is a reversal of the above procedure.

5.10.3 Valve Body Assembly

Unscrew and remove securing nuts on side of compressor casing.

Remove valve body from compressor body.

Replacement is a reversal of the above procedure.

5.11 Testing

After carrying out any repair work or servicing of the equipment, the following tests should be performed.

5.11.1 Electrical Safety Checks

5.11.1.1 *Ground continuity test*

Check the integrity of the bond between the ground pin on the cord plug and grounded dead metal parts in the pump.

The bond resistance should be not more than 0.2 ohms.

5.11.1.2 *Leakage current test*

Measure the risk currents in accordance with the AAMI American National Standard "Safe Current Limits for Electromedical Apparatus" or as specified in UL 544.

5.11.2 Pressure, Flow and Calibration Checks

To test and calibrate the pump unit correctly the following equipment is required:

- A sphygmomanometer or pressure gauge (0-160 mmHg)
- A flowmeter (0-10 liter/minute)

The given values of pressure and flow are for a pump running at normal operating temperature.

5.11.2.1 *Pressure check*

Attach the pressure gauge/sphygmomanometer tube to the top outlet port and use the fingers, or suitable plugs, to close the other two outlets. When the top outlet is operating, rotate the pressure control knob over its full range. Pressure range should be:

30 mmHg on minimum setting

100-110 mmHg on maximum setting

Check the pressure at the other two outlet ports in the same manner.

Variation between ports must not be greater than 4 mmHg.

5.11.2.2 *Calibration*

If the pressure readings are not as specified, perform the following:

Remove the pressure control knob by slackening off the side screw. Rotate the brass arbor until the pressure reads 105 mmHg. Carefully replace the pressure control knob, ensuring that the pointer is aligned at the maximum setting on the face label. Press the knob firmly into the recess, compressing the friction spring, then tighten the side screw.

Check the minimum and maximum settings and readjust if necessary.

5.11.2.3 *Flow check*

Attach the flowmeter tube to the port being tested and, with the other two ports closed, check the flow measurement.

The flow reading should not be less than 4 liter/minute free flow.

Difference in flow between ports should not be greater than 1 liter/minute.

5.11.3 Functional Check

Run the pump,with a garment attached, for a minimum of 1 hour and check calibration again. Adjust if required.

6 TECHNICAL SPECIFICATIONS

FLOWPRESS Pump

Model Number	AC300
Voltage	120 V ± 10% 60 Hz
Input power	14 Watts
Fuse	F 500mA, 250V
Size (approx.)	10.5 x 4.5 x 3.5 inches (26 x 12 x 10 cms)
Weight	5.5 lbs (2.5 kg)
Pressure range	30 to 100 mmHg
Cycle time	3 minutes
Total time inflated	
Chamber 1 (lower)	1 minute 54 seconds
Chamber 2 (middle)	1 minute 16 seconds
Chamber 3 (upper)	38 seconds
Deflation	1 minute
Indicators	Power on Pressure gauge

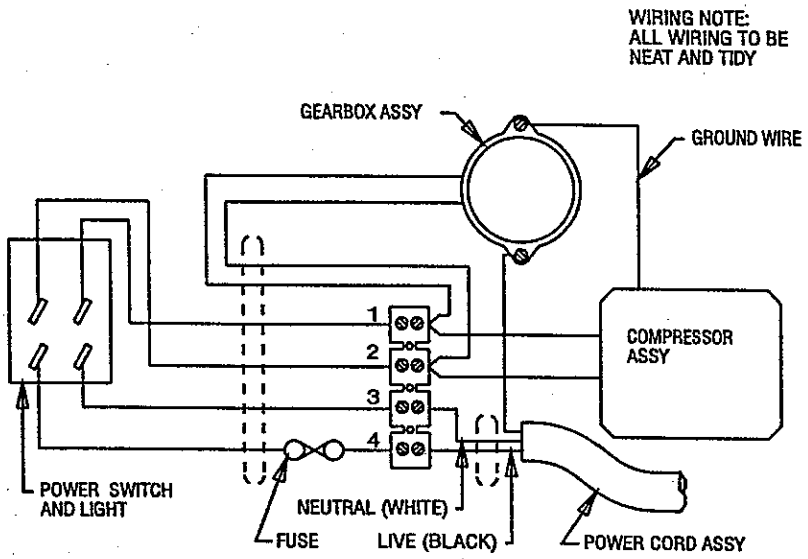
GARMENTS

From the FLOWPRESS range as appropriate. Full details will be provided on request.

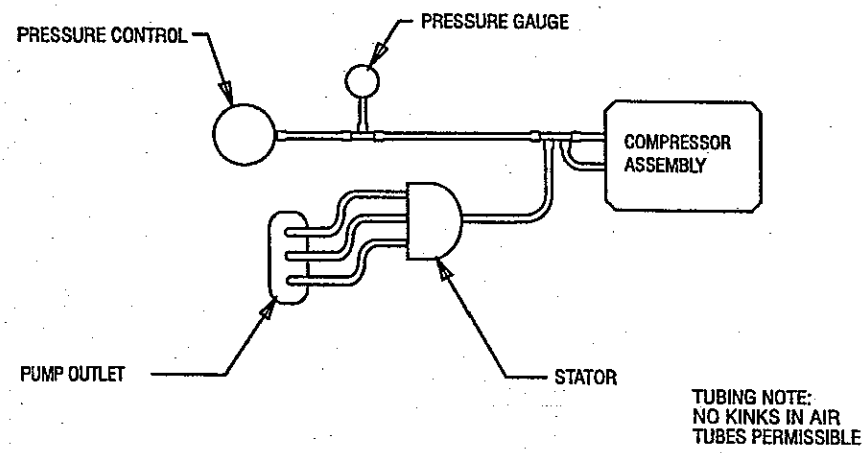
The following is a recommended list of spare parts which should be kept in stock for the purpose of servicing the pump.

Recommended Spare Parts For FLOWPRESS Pump Units (120V)				
Part No	Description	Number Of Pumps		
		5	10	20
BP006	POWER ON/OFF SWITCH	1	2	4
BP327	GEARBOX ASSEMBLY	1	2	2
PRE042	PRESSURE CONTROL ASSEMBLY	1	1	2
BP205	CASE FEET (GREY)	4	8	12
BP330	TUBE ASSEMBLY GAUGE	1	21	41
PRE041	THREE WAY PUMP OUTLET	1	1	1
PRE004	CONTROL KNOB	1	1	2
PRE013	FRICTION SPRING WASHER	2	2	4
BP203	SNAP FIT FUSE HOLDER	1	2	2
BP027	COMPRESSOR SUPPORT RUBBER	12	12	24
BP044	INLET FILTER	5	15	20
BP190	SPONGE STRIP	5	15	20
BP196	CABLE TIE	2	4	6
BP218	NEMKO STRAP	1	2	2
CAS029	STRAIN RELIEF BUSH	1	2	2
BP547	CAUTION LABEL (FDA)	2	2	2
BP304	FACE LABEL	2	4	6
BP507	OPERATING INSTRUCTIONS	2	2	4

Part No	Description	Number Of Pumps		
		5	10	20
BP532	BASE FLOWPRESS (DRILLED)	1	1	2
BP087	POWER CABLE ASSEMBLY	1	2	2
NMB020	4 WAY TERMINAL BLOCK	1	2	2
BP466	TOP ENCLOSURE	1	1	2
BP130	PRESSURE MANOMETER	1	1	2
BP105	GAUGE BRACKET	1	1	2
BP444	COMPRESSOR ASSEMBLY	1	2	2
BP447	COIL ASSEMBLY (5K TURNS)	1	1	1
BP028	"E" STACK	1	1	1
BP069	SILENCER BAG ASSEMBLY	5	5	10
BP214	RIGHT HAND BELLOW ASSEMBLY	5	10	20
BP215	LEFT HAND BELLOW ASSEMBLY	5	10	20
BP181	COMPRESSOR CASTING	1	1	2
BP182	COMP CASTING LID	1	1	2
BP032	COMPRESSOR GASKET	1	1	2
BP351	VALVE BODY ASSY (BLUE)	10	10	20
BP043	ARMATURE PIVOT	10	10	20
VIB004	GROMMET	1	1	2



WIRING DIAGRAM



PNEUMATIC DIAGRAM

FLPRESS

FLOWPRESS (AC300)

PARTS LIST

AC300 (120V) PUMP UNIT

Part No.	Description	Qty per Pump
BP006	Power On/Off Switch	1
BP327	Gearbox / Rotor Assembly (120Volt)	1
PRE042	Pressure Control Assembly	1
PRE014	Three way pump outlet	1
BP205	Case Feet Grey	4
CAS029	Strain Relief Bush	1
BP218	Nemko Strap	1
BP203	Fuse Holder Assembly	1
BP180	Blanking Plate Neon	1
BP330	Tube Assembly Gauge	1
PRE004	Control Knob	1
PRE013	Friction Spring Washer	1
BP027	Compressor Support Rubber	6
BP044	Inlet Filter	1
BP190	Sponge Strip	1
BP196	Cable Tie	2
247075	Hang Strap Assembly	1
BP014	Hang Strap Plate	1
BP547	Caution Label (FDA)	1
BP304	Face Label Flowpress	1
BP507	Flowpress Operating Instructions	1

Part No.	Description	Qty per Pump
BP538	**Bottom Enclosure Assembly.**	**1**
BP352	Base Flowpress (Drilled)	1
BP411	Power Cable Assembly	1
NMB020	4 Way Terminal Block	1
BP466	Top Enclosure Flowplus	1
BP130	Pressure Manometer	1
BP105	Gauge Bracket	1
BP444	**Compressor Assembly (120Volt)**	**1**
BP447	Coil Assembly (5K Turns 120Volt)	1
BP028	"E" Stack	1
BP069	Silencer Bag Assy	1
BP214	Right Hand Bellow / Armature Assembly	1
BP215	Left Hand Bellow / Armature Assembly	1
BP181	Compressor Casing	1
BP182	Compressor Lid	1
BP032	Compressor Gasket	1
BP351	Valve Body (Blue)	2
BP043	Armature Pivot	2
VIB004	Grommet	1